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IS 10402 (1982): pin-needle hardboard boxes for packaging of apples [CED 9: Timber and Timber Stores]



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*Indian Standard*

SPECIFICATION FOR  
PINE-NEEDLE HARDBOARD BOXES  
FOR PACKAGING OF APPLES

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INDIAN STANDARDS INSTITUTION  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

# *Indian Standard*

## SPECIFICATION FOR PINE-NEEDLE HARDBOARD BOXES FOR PACKAGING OF APPLES

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*Indian Standard*  
**SPECIFICATION FOR  
PINE-NEEDLE HARDBOARD BOXES  
FOR PACKAGING OF APPLES**

**0. FOREWORD**

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 30 November 1982, after the draft finalized by the Wood and Wood Products Containers Sectional Committee had been approved by the Marine, Cargo Movement and Packaging Division Council.

**0.2** Apples are transported over long distances to different parts of the country. Being perishable, they are subject to spoilage which can in part be attributed to inadequate packages, which are unable to withstand the hazards of handling in transportation. A specification on wooden boxes for packaging of apples ( IS:3728-1966 ) has already been published. In order to provide alternate materials of packaging with a quality product this standard on pine needle hardboard boxes for packaging of apples is being brought out. It is hoped that this will help cost reduction and better utilization of forest products.

**0.3** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS:2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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**1. SCOPE**

**1.1** This standard prescribes the general requirements and the methods of test for pine-needle hardboard boxes for the packaging of apples.

**2. TERMINOLOGY**

**2.1** For the purpose of this standard the definitions given in IS:6703-1972† shall apply.

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\*Rules for rounding off numerical values ( revised ).

†Glossary of wooden packaging terms.

### 3. MATERIALS

#### 3.1 Timber

3.1.1 Timber species for battens shall be of any of the Group I, II or III listed in Appendix A of IS:6662-1980\*. Any other suitable timber not included in the above standard may be used for battens with the prior approval, in writing, of the purchaser.

3.1.2 The battens shall be seasoned to a moisture content not exceeding 18 percent and the inclination of grain shall not exceed 1 in 10. The timber shall be free from centre heart (pith), insect attack, any kind of decay (rot), objectionable knots, splits, warping and any other defect which may reduce the strength of battens.

#### 3.2 Pine-Needle Hardboard

3.2.1 *Thickness of Boards* — The thickness of pine-needle hardboards used for the manufacture of boxes shall be  $3.50 \pm 0.25$  mm.

3.2.2 The moisture content of pine-needle hardboards at the time of manufacture of apple boxes shall be  $12 \pm 3$  percent. Unless the boards are of moisture-proof quality, they shall be given a suitable coating on both sides to prevent undue moisture absorption.

3.2.3 The finished boards and battens shall not emit any odour or impart toxicity and taint which may have any undesirable effect on the apples either in taste, smell or colour.

#### 3.3 Nails

3.3.1 The nails used in the manufacture of boxes shall be of clout headed type, conforming to IS:723-1972†. Length of nails shall be sufficient to have a clinching of 5 mm.

#### 3.4 Strappings

3.4.1 Mild steel wire and metal strips may be used for binding the boxes (see IS:280-1978‡, IS:1029-1970§ or IS:1731-1971||). Polypropylene or low-density polyethylene (LDPE) straps properly reinforced on the edges, may also be used.

### 4. DIMENSIONS, MASS AND STYLE OF BOXES

4.1 *Dimensions and Mass* — The internal dimensions and the maximum permissible mass of boxes shall be as given in Table 1.

\*Timber species suitable for wooden packaging (first revision).

†Specification for steel countersunk head wire nails (first revision).

‡Specification for mild steel wire for general engineering purposes (third revision).

§Specification for hot rolled steel strips (baling) (first revision).

||Dimensions for steel flats for structural and general engineering purposes (first revision).



**TABLE 1 INTERNAL DIMENSIONS AND MAXIMUM PERMISSIBLE MASS OF BOXES**

( Clause 4.1 )

SL No.	LENGTH mm	WIDTH mm	HEIGHT mm	MAXIMUM PERMISSIBLE MASS OF EMPTY BOX kg
1.	455	305	305	4.00
2.	455	305	280	3.80
3.	455	305	255	3.60

**4.1.1 Tolerances** — A tolerance of  $\pm 3$  mm shall be permitted in length, width and height of the boxes. No plus tolerance shall be permitted in the mass of individual boxes.

**4.2 Style** — There shall be only one style of the apple box as shown in Fig. 1. The apple boxes of pine-needle hardboard of other styles may also be made with the prior approval, in writing, of the purchaser.

## 5. REQUIREMENTS AND ASSEMBLY OF BOXES

**5.1 Board Panels** — Only one piece of pine-needle board shall be used to make one panel. Five slots of size 10 cm  $\times$  3 mm or six ventilation holes of 1.25 cm diameter shall be cut on the front-side panel ( as shown in Fig. 1 ) as well as on the back-side panel in such a manner that they do not affect the performance requirements of the boxes. For fixing battens to the panels the nails shall be staggered in two parallel rows and shall be equally spaced as shown in Fig. 1.

**5.2** Each box shall be constructed as shown in Fig. 1, from 6 hardboard panels, 24 battens and nails as specified in Table 2. The cross-section of top, bottom and side battens shall be 20  $\times$  10 mm and end battens 25  $\times$  20 mm. For assembling the box, side panels shall be nailed to the end panels, and top and bottom panels to the end and side panels as shown in Fig. 1. As far as possible, the nails shall be equally spaced.

**5.3** The boxes after being filled with the apples may be securely bound by any of the strappings mentioned in 3.4.

## 6. WORKMANSHIP AND FINISH

**6.1** The pine needle board panels and battens shall be of even thickness and reasonably smooth. The battens shall have the ends mitred ( 45° ) across the narrow face.

**6.2** The nails used for fixing battens to the panels shall be well clinched so as not to damage in any manner the contents of the boxes.

TABLE 2 COMPONENTS OF PINE-NEEDLE HARDBOARD BOXES

( Clause 5.2 )

( All dimensions are in millimetres )

*Internal dimensions of apple boxes and number and sizes of components*

Sl No.	Parts	455 × 305 × 305	455 × 305 × 280	455 × 305 × 255
1.	Board panels	2 panels-502 × 332 ( top and bottom ) 2 panels-502 × 305 ( sides ) 2 panels-305 × 305 ( ends )	2 panels-502 × 332 ( top and bottom ) 2 panels-502 × 280 ( sides ) 2 panels-280 × 280 ( ends )	2 panels-502 × 332 2 panels-502 × 255 2 panels-255 × 255
2.	Battens ( see Note )	8 in no.-502 × 20 × 10 8 in no.-305 × 20 × 10 8 in no.-305 × 25 × 20	8 in no.-502 × 20 × 10 4 in no.-305 × 25 × 20 4 in no.-280 × 25 × 20 4 in no.-305 × 20 × 10 4 in no.-280 × 20 × 10	8 in no.-502 × 20 × 10 4 in no.-305 × 25 × 20 4 in no.-305 × 20 × 10 4 in no.-255 × 25 × 20 4 in no.-255 × 20 × 10
3.	Nails	80 in no.-19 × 1.4 ( for fixing battens to panels ) 44 in no.-32 × 1.4 ( for assembly of the box )	72 in no.-19 × 1.4 ( for fixing battens to panels ) 44 in no.-32 × 1.4 ( for assembly of the box )	64 in no.-19 × 1.4 ( for fixing battens to panels ) 44 in no.-32 × 1.4 ( for assembly of the box )

NOTE — No minus tolerance shall be permitted in the cross-section of battens.

## 7. PACKING

7.1 The boxes shall be delivered in complete sets of shocks in a clean condition. Each type of component that is top, bottom side or end, shall be firmly bundled together with a suitable cord, string or metal binding.

7.2 The boxes may be delivered in an assembled condition, if desired by the purchaser.

## 8. TESTING

### 8.1 Pine-Needle Boards

**8.1.1 Impact Resistance Test** — A specimen of size 220 × 220 mm of pine-needle hardboard shall be clamped along all the four edges in the wooden frame of impact-resistance test equipment [see IS:1734 (Part XVIII)-1972\*]. A vertical rod having a metallic hemispherical end of diameter 2.5 cm and weighing 1 kg shall be dropped repeatedly 5 times from a constant height of 50 cm. The specimen, after undergoing the above test, shall be examined and it shall be considered to have failed if rupture across the whole thickness of the specimen is noticed. At least one specimen from each of 5 different boards of a particular lot shall be tested.

**8.1.2 Moisture Absorption Test** — A specimen of size 150 × 150 mm of pine-needle hardboard shall be conditioned to 12 percent moisture content, weighed, and kept in a closed chamber maintained at  $80 \pm 5$  percent RH and  $35 \pm 2^\circ\text{C}$  temperature for 5 days (that is 120 hours). The specimen shall be re-weighed and from its initial and final weights, the amount of moisture absorbed by the specimen shall be determined. The specimen shall be considered to have passed the criteria of acceptability if the moisture absorption is found to be not more than 3 percent at the end of the test. At least one specimen from each of 5 different boards of a particular lot shall be tested.

**8.1.3 Surface Water Penetration Test** — A specimen of 15 cm diameter of pine-needle board shall be clamped tightly in the Cobb test apparatus [see IS:1060 (Part I)-1966†] ensuring that a surface area of 100 cm<sup>2</sup> is available for the test. 250 ml water shall be filled in the cylinder of the test apparatus and retained for 30 minutes. The amount of water which penetrates in the surface area of 100 sq. cm shall be determined by taking the difference of initial and final weights of the specimen. The specimen shall be considered to have passed the criteria of acceptability if the water absorption is not more than 1 g on a surface area of 100 cm<sup>2</sup>. At least one specimen from each of 5 different boards of a particular lot shall be tested.

\*Methods of test for plywood: Part XVIII Impact resistance test on the surface of plywood (first revision).

†Methods of sampling and test for paper and allied products, Part I.

**8.1.4 Toxicity Test** — A specimen of 5 × 5 cm obtained from the board shall be cut into small pieces and extracted with 30 ml physiological saline at 85°C for one hour. The extract shall be cooled and centrifuged. The supernatant shall be injected intravenously at the rate of 0.5 ml per mouse to 10 mice ( 5 males and 5 females ) and the mice shall be examined at frequent intervals till 72 hours for any signs of toxicity.

NOTE — This shall be an optional test and it may be required to be carried out whenever there is any change in the manufacturing process of pine-needle hardboards. This test should preferably be carried out in a recognized toxicological laboratory fully equipped for the purpose.

## 8.2 Performance Tests for Boxes

**8.2.1 Top-Bottom Compression Test** — The assembled empty box when tested [ *see* IS: 7028 ( Part II )-1973\* ] shall not fail below a compression load of 1 500 kg. At least 5 boxes shall be tested from a lot of 100 boxes.

**8.2.2 Flat Drop Test** — The assembled box fully packed with the apples ( or equivalent dummy load ) and dropped freely from a height of one metre on a concrete platform [ *see* IS: 7028 ( Part IV )-1973† ] shall not show any failures ( indicated in 8.3 ) before the completion of two cycles. A cycle shall consist of one drop on all the six faces ( top, bottom, two sides and two ends ). At least 5 boxes shall be tested from a lot of 100 boxes.

**8.2.3 Tumbling Test** — The assembled box fully packed with the apples ( or equivalent dummy load ) shall be manually tumbled on a metalled road up to a distance of 30 metres from the starting point in such a manner that all the six faces ( top, bottom, two sides and two ends ) of the box are subjected to equal number of falls on the road. At least one box shall be tested from a lot of 100 boxes and it shall not show any of the failures indicated in 8.3.

**8.3** If the tested boxes display any of the failures, as detailed below, before they pass the criteria of acceptability, the whole lot shall be rejected. If any other type of failure not indicated below and considered to be of a nature that would damage the apples in transit, is observed, a second set of samples shall be taken for repetition of tests in 8.2 and if the same defect is observed again the whole lot may be rejected:

- a) Loosening of a number of nails,
- b) Complete pulling out of a large number of nails,
- c) Splitting of battens,
- d) Breaking of battens,

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\*Performance tests for complete filled transport packages: Part II Vibration test ( *reaffirmed 1978* ).

†Performance tests for complete filled transport packages: Part IV Vertical impact drop tests ( *reaffirmed 1978* ).

- e) Tearing of panels or battens through nail holes,
- f) Removal or separation of battens from panels,
- g) Sliding of batten joints,
- h) Breaking or tearing of panels,
- j) Severe crushing of battens at the edges or corners of the box,
- k) Separation of panels of the box,
- m) Spilling of contents through failures, and
- n) Complete collapse of the box.

## 9. MARKING

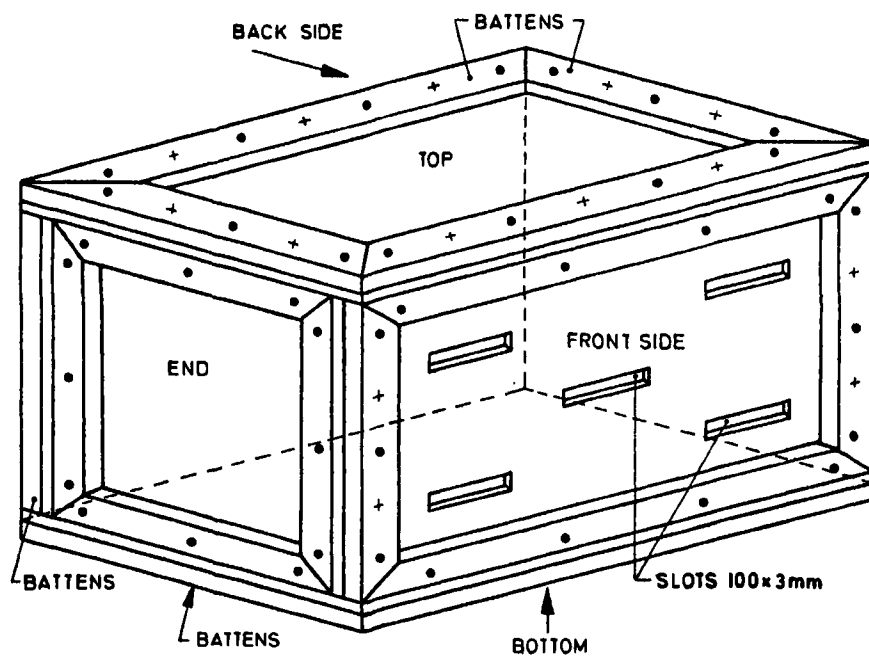
**9.1** Unless otherwise agreed to between the manufacturer and the purchaser, each box shall be legibly marked, or stencilled, with the following information:

- a) Manufacturer's name or trade-mark,
- b) Year of manufacture, and
- c) Size.

**9.1.1** The pine-needle hardboard boxes may also be marked with the ISI Certification Mark.

**NOTE** — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution ( Certification Marks ) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

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●Nails for joining battens and panels.

+Nails for assembling the box.

All dimensions in millimetres.

FIG. 1 PINE-NEEDLE HARDBOARD BOX

## INTERNATIONAL SYSTEM OF UNITS ( SI UNITS )

### Base Units

<i>Quantity</i>	<i>Unit</i>	<i>Symbol</i>
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

### Supplementary Units

<i>Quantity</i>	<i>Unit</i>	<i>Symbol</i>
Plane angle	radian	rad
Solid angle	steradian	sr

### Derived Units

<i>Quantity</i>	<i>Unit</i>	<i>Symbol</i>	<i>Definition</i>
Force	newton	N	1 N = 1 kg. m/s <sup>2</sup>
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m <sup>2</sup>
Frequency	hertz	Hz	1 Hz = 1 c/s (s <sup>-1</sup> )
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m <sup>2</sup>

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